

DETAILED ACTION

Response to Amendment

1. The amendments and arguments/remarks filed on 09 October 2009 have been entered and fully considered.
2. Instant claims 1-18 have been amended by Applicant's amendment - instant claim 2 has been amended even though it is listed as being "Original" and instant claim 12 has not been amended even though it is listed as being "Currently Amended".
3. The objection to the instant Abstract has been withdrawn in light of Applicant's amendment.
4. The objection to instant claim 18 has been withdrawn in light of Applicant's amendment.
5. The rejection of instant claim 15 under 35 U.S.C. 112, 2nd paragraph has been withdrawn in light of Applicant's amendment.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 14 recites the limitation "A process for the thermal decomposition..." in the first line, but recites a dependency to the device of instant claim 1, which does not recite a process. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-10 and 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 2,488,406 (Hirsch), and further in view of U.S. Patent 3,012,861 (Ling).

In regards to instant claim 1, Hirsch discloses a reactor apparatus (Figure 1 and col. 3, lines 55-75) having a pressure vessel (shell 10) with a conical bottom 11, a catalyst reactivator 19 and standpipe 18 (similar to a reaction tube), gas feed 20, and a cooling tubes 12 that are mounted in the walls of the device. Hirsch discloses cyclone separators extending from inside the top of the pressure vessel to the reactor and further connecting to catalyst recovery equipment that is outside the pressure vessel (Fig. 1), which includes a catalyst scrubber for removing catalyst particles (Fig. 2; and col. 5, lines 53-58) – a form of filtering.

Hirsch does not expressly disclose a heat source, or a gas outlet unit having a gas inlet/guiding region, filtering system, and gas outlet. However, Ling discloses a

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silicon reactor apparatus (Figure 1 and col. 2, lines 1-19) having a heating means 11, a conical bottom 3 connected to a valve outlet 14, and an outlet unit comprised of outlet 9, cyclone 13, condensing system 10 for removing by-product gases. Hirsch and Ling are analogous art in that they both disclose the use of an apparatus having reactors. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the components of the Ling reactor apparatus to modify the Hirsch reactor apparatus for the purpose of disclosing a device for performing a method of thermally decomposing volatile silicon compounds as disclosed in col. 1, lines 9-12 of Ling.

In regards to instant claim 2, Hirsch discloses cooling tubes 12 that are mounted in the walls of the device (col. 3, line 60). Ling discloses a cooling component in col. 4, lines 30-32.

In regards to instant claim 3, Hirsch discloses that the catalyst reactivator 19 and standpipe 18 are 2.0 ft and 16 ft tall, respectively (col. 8, lines 16-22).

In regards to instant claim 4, Hirsch discloses that the catalyst reactivator 19 and standpipe 18 have diameters of 5.0 ft and 2.5 ft, respectively (col. 8, lines 16-22).

In regards to instant claim 5, Ling discloses a quartz reactor (col. 2, line 57) and using nickel for a reactor 9 (col. 6, line 24).

In regards to instant claim 6, Ling discloses a heating means surrounding a reactor (col. 2, lines 15-16).

In regards to instant claim 7, Hirsch discloses cooling tubes 12 that are mounted in the walls of the device (col. 3, line 60). Ling discloses a cooling component in col. 4, lines 30-32.

In regards to instant claim 8, Ling discloses a heating source the length of the reactor in Figure 1.

In regards to instant claim 9, since it has been held to be obvious to one of ordinary skill in the art to apply a known technique to a known device (method, or product) ready for improvement to yield predictable results, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use one or more reactors for the purpose of producing more product. (*KSR*, 550 U.S. at ___, 82 USPQ2d at 1396; MPEP 2141 Examination Guidelines..., III. Rationales...)

In regards to instant claim 10, Hirsch discloses the use of a flat plate or gate slide valve at the bottom component of the reactor (col. 4, lines 1-3).

In regards to claim 13, Hirsch discloses the use of water flowing around the cooler tubes 12 (col. 4, lines 53-55). Ling discloses the use of a water jacket in col. 4, line 42.

In regards to instant claim 14, an apparatus for heating at least a region of a reactor is disclosed by Ling (col. 2, line 33), cooling a region of a reactor (col. 3, lines 58-60 of Hirsch; and col. 4, lines 30-32 of Ling), Ling discloses the feeding of silicon tetraiodide into a reactor in the presence of argon gas to produce hyper-pure silicon particles (col. 3, lines 6-23), Ling discloses a conical bottom (3 in Figure 1) and

removing product silicon through a valve outlet (4 of Figure 1) in col. 2, lines 16-19.

Ling discloses the removal of by-product gases in col. 2, lines 9-10.

In regards to instant claim 15, Ling discloses heating a reactor to produce high purity silicon using silicon tetraiodide in col. 2, line 45-46.

In regards to instant claim 16, Hirsch discloses the use of 100°F water for cooling in col. 8, line 55.

In regards to instant claim 17 and 19, Ling discloses the decomposition of several silicon compounds, including silane or monosilane between the temperatures of about 600°C to 1200°C (col. 5, line 64).

In regards to instant claim 18, Ling discloses a conical bottom (3 in Figure 1) and removing product silicon through a valve outlet (4 of Figure 1) in col. 2, lines 16-19.

In regards to instant claim 20, Ling disclose the use of an inert diluent gas such as hydrogen for silane in col. 5, line 29.

Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 2,488,406 (Hirsch) and U.S. Patent 3,012,861 (Ling) as applied to claim 1 above, and further in view of U.S. Patent 5,421,843 (Teague et al.).

Instant claims 11-12 are dependent on previously rejected instant claim 1, see rejection above. In regards to instant claims 11-12, Hirsch discloses a reactor apparatus (Figure 1 and col. 3, lines 55-75) having a pressure vessel (shell 10) with a conical bottom 11, a catalyst reactivator 19 and standpipe 18 (similar to a reaction tube), gas feed 20, and a cooling tubes 12 that are mounted in the walls of the device.

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Hirsch discloses cyclone separators inside the top of the pressure vessel that connect to catalyst recovery equipment that is outside the pressure vessel (Fig. 1), which includes a catalyst scrubber for removing catalyst particles (Fig. 2; and col. 5, lines 53-58). Furthermore, Hirsch discloses the use of other separators, such as electrostatic precipitators, filters and the like (col. 5, lines 46-47).

Hirsch does not disclose a heat source, a collection cone, or a gas outlet unit having a gas inlet/guiding region, filtering system, and gas outlet. However, Ling discloses a silicon reactor apparatus (Figure 1 and col. 2, lines 1-19) having a heating means 11, a conical bottom 3 connected to a valve outlet 14, and an outlet unit comprised of outlet 9, cyclone 13, condensing system 10 for removing by-product gases. Hirsch and Ling are analogous art in that they both disclose the use of a reactor.

Neither Hirsch nor Ling expressly discloses the use of filter candles. However, Teague et al. recites the use of filter candles made from organic or inorganic fibers for filtering emissions-containing air in claims 1-4. Hirsch, Ling, and Teague et al. are analogous art in that they disclose the use of a reactor. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the use of the Teague et al. filter candles with the modified Hirsch and Ling reactor apparatus for the purpose of removing emissions from a processing operation (Abstract of Teague et al.).

Response to Arguments

Applicant's arguments/remarks filed 09 October 2009 have been fully considered but they are not persuasive.

Applicant stated on p. 11 of the remarks that the rejection of instant claim 14 is obviated by the current amendment. Instant claim 14 recites a process, but is dependent on instant claim 1, which recites a device. Instant claim 1 does not recite a process, and therefore has no antecedent basis for the process of instant claim 14.

Applicant states on p. 11-12 of the remarks that Hirsch, Ling, and Teague et al. (U.S. Patent 2,488,406; U.S. Patent 3,012,861; and U.S. Patent 5,421,843 – respectively) fail to disclose or suggest at least one reaction tube located inside a pressure vessel such that an open end of the reaction tube extends into the pressure vessel and the other end of the reaction tube is located outside the pressure vessel, and a gas outlet unit having an inlet region located inside the pressure vessel and a outlet region located outside the pressure vessel. Hirsch discloses a reactor device in Fig. 1 that has a reactor tube component (reactivator 19) inside a pressure vessel, and Ling discloses a reactor device in its Fig. that has a reactor tube in a low-pressure area (col. 2, lines 31-34). Ling further disclose that the reactor tube has an outlet and filtering system that extends out of the reactor tube and outside the low pressure area (Fig.), and Hirsch discloses catalyst recovery equipment inside the top of the pressure vessel that extends to outside the pressure vessel (Fig. 1), which includes a catalyst scrubber for removing catalyst particles (Fig. 2; and col. 5, lines 53-58) – a form of filtering.

Applicant states on p. 12 of the remarks that Hirsch and Ling are in different fields of endeavor. Hirsch and Ling both disclose chemical reactor devices in their figures and further explicitly state that their devices have reactors for chemical reactions (Hirsch - col. 3, lines 43-54; and Ling - col. 2, lines 1-19).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN T. KILPATRICK whose telephone number is

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(571)270-5553. The examiner can normally be reached on Monday - Friday, 7:30 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571)272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. T. K./
Examiner, Art Unit 1797

/Samuel P Siefke/
Primary Examiner, Art Unit 1797